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U. S. DEPARTMENT OF AGRICULTURE

FEDERAL-GRANT RESEARCH
at the
STATE AGRICULTURAL
EXPERIMENT STATIONS

Projects on
AGRICULTURAL ENGINEERING
Part 3, Section b
Power Machinery and Equipment

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

Compiled March 1958, by

The State Experiment Stations Division, Agricultural Research Service, U. S. Department of Agriculture, Washington 25, D. C., for use of workers in agricultural research in the subject-matter areas presented. For information on specific research projects write to the Director of the Station where the research is being conducted.

Issued May 1958

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INTRODUCTION

This compilation is one of a series providing information on State agricultural experiment station research supported by Federal grant funds appropriated annually by Congress under authorization of the Hatch Act of 1887, as amended and approved Aug. 11, 1955, and Section 204(b) of the Agricultural Marketing Act of 1946. It is prepared for use by research workers in the subject-matter areas presented. Only that part of each State's research program supported by Federal-grant moneys is included.

In addition to the Federal-grant moneys, the State experiment stations receive some Federal support through cooperative agreements of contracts with the U. S. Department of Agriculture. Information on such research, along with other departmental research, is available in the Central Project Office, Agricultural Research Service.

A substantial part of each State agricultural experiment station's research is supported with moneys appropriated by the respective State or Territorial Legislatures and through other forms of private and public financing. Information on current agricultural research at the stations which is not financed under the Federal-grant program or through USDA cooperation can be obtained from experiment station directors.

The information given in the series of Federal-grant compilations includes the title and objectives of each Federal-grant project pertaining to the subject given on the cover. The identification of each project gives the department(s) conducting the research, the station number of the project, and the number of the regional project if it is a contributing project.

Relevant regional projects appear at the end of the compilation. States having projects contributing to regional projects are indicated. The States are grouped into four major regions. These are designated NC-North Central, NE-Northeastern, S-Southern, and W-Western.

FEDERAL-GRANT RESEARCH, ALPHABETICALLY BY STATE

Ala. Mechanization of the Harvesting of Cotton. To evaluate and improve (1) machines and methods for preparing cotton crop of mechanized harvest; (2) machines and methods for mechanical harvesting; and (3) mechanical harvester performance in relation to plant characteristics.

Agr. Engin. 506 (S-2) Coop. ARS

Ala. Grain and Forage Harvesting, Processing and Storage. To develop improved methods and to adapt equipment for (1) harvesting, conveying, drying, storing, mixing, grinding, and feeding grains; (2) harvesting, conveying, drying, storing, mixing, grinding, and feeding hay crops that will reduce labor requirements and processing costs and improve hay quality; (3) feeding silage crops that will reduce labor and processing costs and improve silage.

Agr. Engin., Hort. 572

Alaska Land Clearing Equipment and Methods for Alaska. To develop and introduce specialized equipment and techniques to reduce the cost of clearing land for agricultural purposes.

Agr. Engin. 31 Coop. SCS

Alaska Facilitating Marketing of Alaska's Cereal Grains. (1) Study equilibrium moisture content of barley, oats, and wheat stored under Alaska's environmental conditions; (2) determine a safe moisture content for these grains; (3) examine organisms causing deterioration of stored grains and study effect of these organisms on germination, weight loss and nutritive value; (4) explore commercial use of a batch dryer developed by the Alaska Agricultural Experiment Station; (5) explore effectiveness and economics of forced air bin drying at rates of 6 and 12 cfm. per bushel.

Agr. Engin., Agron., Pl. Path. 56 II, ES 448

Ariz. Mechanization of Cotton Production and Harvesting. Reduce cost of producing cotton by eliminating as much hand labor as possible while maintaining or improving quality and yield.

Agr. Engin., Agron., Pl. Path. 269 (W-24)

Ark. Engineering Aspects of the Mechanization of Cotton Production and Harvesting in Arkansas. To design and improve machines and develop methods which will reduce manpower needs to a minimum and increase output per laborer to a maximum with respect to the following phases connected with growing of cotton: (1) seedbed preparation, (2) weed control, (3) evaluating and improving machines for preparing the cotton crop for harvest, and (4) evaluating mechanical harvester performance in relation to plant characteristics.

Agr. Engin. 395 (S-2)

Ark. The Effect of Drying Pack Thickness Upon Head Rice Yields and Germination. Learn maximum and optimum thickness for rice drying pack, or bed, where rice is moving and where it is static.
Agr. Econ. 434

Ark. The Effects of Variations in Moisture, Temperature, and Time During the Drying and Storage Process Upon the Market Value of Rice. To reduce (1) amount of checking in conditioning and drying processes and thereby increase market value of rice; (2) time required to condition and dry a given lot of rice and thereby reduce amount of storage damage during and after drying.
Agr. Engin., Agr. Econ. and Rural Sociol. 435

Ark. Engineering Aspects of the Artificial Drying and Storage of Hay. (1) Learn feasibility of artificial drying of loose, chopped and baled hay under State conditions; (2) study various structures and methods of storage and self-feeding of hay.
Agr. Engin. 442

Calif. Forage Seed Harvesting and Processing. (1) Learn distribution of seed, straw, and chaff rates for components of combine harvester, and how rate distribution is affected by method of preparing crop for harvest. (2) Study seed losses and mechanically damaged seed during harvesting and how these factors are affected by crop preparation and combine adjustments. (3) Field test preparation methods for Ladino and red clover seed crops to learn method and equipment for obtaining maximum high quality seed at reasonable cost. (4) Design and test auxiliary equipment or modify combine components for increased capacity. (5) Design and field test a device for automatic feed rate into a combine for prescribed range of seed loss. (1 - 5 for small seeded legumes). (6) Learn seed loss and damage with harvesting methods using commercial harvesting equipment for grass forage. (7) Modify or develop new harvesting techniques and cultural practices for seed production. (8) Conduct laboratory study pneumatic conveying for equations affecting mechanical seed damage. (9) Conduct laboratory study of seed conveyors for adaptation to certified seed processors. (10) Continue laboratory study on combine shoe for variables controlling seed recovery.
Agr. Engin., Agron. 1549

Calif. Development of Mechanical Harvesting and Field Handling of Deciduous Tree Fruits, Nuts, Grapes, Olives, Berries, and Vegetables. To (1) reduce labor requirements and unit costs of harvesting tree and vine crops thru design and development of mechanical equipment and improved handling techniques; and (2) maintain quality of final product under a revised harvesting system.

Agr. Engin., Pomol., Vitic. 1551

Calif. Engineering, Qualitative and Economic Studies of the Packaging, Handling and Shipping of Deciduous Fruit. To (1) develop new containers, suitable equipment and improved techniques for packaging and handling deciduous fruit, and determine how these developments influence plant operations, packing and shipping costs and quality of product at consumer level; (2) determine basic laws underlying volume fill in containers for various shapes and sizes; (3) work with container manufacturers in developing suitable containers and standardizing packages as soon as basic principles are established; (4) develop improved equipment for more accurate sizing of fruit if needed; (5) if sorting on basis of color becomes necessary, apply known principle of electronic color sorting; (6) study car loading patterns to determine best arrangements for full or partial shipments on containers of various types; (7) determine best methods of pre-cooling fruit packed, or to be packed, in various type containers; (8) keep continuous record of condition and quality of fruit from time it leaves tree until reaching final consumer; (9) study influence of maturity on handling and packaging; (10) make economic studies of pilot packing lines to compare with studies of conventional methods.

Agr. Engin., Pomol., Agr. Econ. 1579

Calif. Time and Motion Studies of Vegetable Harvesting in Relation to New Techniques in Large Scale Production. To (1) develop new and better methods of performing vegetable work by eliminating unessential operations; (2) develop equipment to reduce work in vegetable operations; and (3) obtain ideas as to how methods may be improved by dealing with time intervals required for different operations.

Agr. Engin., Veg. Crops 1592

Calif. Basic Requirements and Design Principles of Mechanical Equipment for the Production and Handling of Vegetable Crops. Reduce cost of producing vegetable crops in southern California without decrease in quality and grade.

Agr. Engin., Veg. Crops 1674

Calif. Development, Improvement, and Testing of Mechanical Equipment for the Production of Cotton. To reduce labor and costs and improve yield and quality. Stock shredders, planters, fertilizers, cultivators, sprayers, dusters, topping machines, and harvesters as well as cultural practices to improve performance of equipment are to be tested.
Agr. Engin., Agron. 1677 (W-24) Coop. ARS

Calif. The Development of Improved Prune Harvesting Methods, and their Effect Upon the Quality of the Fruit. (1) Study methods for separating fruit from the tree. (2) Develop a machine for harvesting fruit off the ground. (3) Study the use of catching frames. (4) Learn effect of various harvesting methods on fruit quality.
Agr. Engin. 1717

Storrs (Conn.) Determination of the Basic Job Requirements of Machinery for Harvesting and Storage of Grass Silage. To (1) develop methods and techniques for determining power needed in separate operations of silage harvesting and loading machines; (2) separate job into individual components and learn power needs to overcome these forces; (3) compare basic power requirements with those of present day equipment, thereby learning relative efficiency and adequacy of design; (4) investigate machines used in industry for similar operation.
Agr. Engin., Agr. Econ., Agron. 218 (NE-13) Coop. ARS

Ga. The Effect of Fertilizer Ratios and Methods of Placement on Peanut Yields. To (1) determine most profitable ratios and rates of fertilizers for use on peanuts, (2) determine optimum placement of peanut fertilizers, and (3) develop satisfactory equipment for optimum fertilizer placement when determined.
Agr. Engin. 20 Coop. ARS

Ga. Mechanization of Cotton Production. To improve (1) methods of disposal of cover crops and crop residues, (2) machinery for planting cotton in trashy soil, and (3) methods of controlling weeds in cotton, including cost reduction.
Agr. Engin. 21 (S-2) Coop. ARS

Ga. Mechanized Farming. To develop a crop rotation system that will use more efficiently farm machinery and labor throughout the year, to learn the adaptability of machinery now available and new machinery as introduced, and to study the cost and labor need for the production of field and vegetable crops with machinery.
Agr. Engin., Agron. 22

Ga. Application of Liquid and Solid Fertilizer Materials. (1) Simplify and increase reliability of equipment for distributing liquid fertilizer materials, and compare economy of their use with solid fertilizers. (2) Develop placement equipment and compare effects of solid fertilizer materials when placed at different depths, banded singly and mixed with the soil for different soils and crops.
Agr. Engin., Agron. 23 Coop. TVA

Ga. The Effects of Placement Depth and Location of Fertilizer Upon the Growth and Yields of Pimiento and Other Vegetable Crops. (1) Learn effect of placement depth and location of fertilizers on growth and productivity of pimiento and other vegetables. (2) Devise equipment and methods for efficient placement of fertilizer at optimum depths.
Hort., Agr. Engin. 93

Ga. Development of Production Practices and Equipment for Mechanical Harvesting and Shelling of Southern Peas (Vigna sinensis). (1) Evaluate most promising varieties for mechanical harvesting and shelling, using equipment available. (2) Devise cultural methods and design and construct necessary equipment for efficient harvesting and shelling of southern peas.
Hort. 94

Hawaii The EDB Dip Process for Fresh Fruits and Vegetables. (1) Analyze equipment needs for applying EDB dip treatment to fresh fruits and vegetables. (2) Compare equipment needed for batch method and continuous method of treatment in terms of engineering and economic factors involved. (3) Design and construct pilot model processing unit.
Agr. Engin. 74.2

Hawaii The Drying of Coffee Beans. (1) Learn design requirements for driers capable of greater economies and efficiencies in processing and increasing coffee quality. (2) Obtain data on thermodynamic properties of coffee while drying, and about mechanical techniques of drying coffee under various conditions of moisture content, temperature of drying air, rate of drying, bean ripeness, and humidity conditions.
Agr. Engin. 74.3

Idaho The Design and Evaluation of Farm Mechanization Systems Under Idaho Conditions. To (1) survey or inventory present status of farm mechanization in Idaho, and (2) learn problem areas in general field of farm mechanization.
Agr. Engin. 264

Ill. Improvement of Efficiency and Safety of Corn Harvesting Machinery. To (1) find improved methods of harvesting corn; (2) establish design principles for corn harvesting equipment which will reduce losses and accident hazards.
Agr. Engin. 10-332

Ill. Improvement of Power, Machinery and Labor Efficiency in Farm Operations. (1) Learn effect of tillage on compacted and non-compacted soils as reflected by corn yield, power requirement for plowing, and physical characteristics of soil; relation between soil compaction, corn yield, power need for tillage, and physical characteristics of soil; study means for improving tilth of compacted soils. (2) Learn flow characteristics of various fertilizer solutions under gravity pressure and develop improved, simplified equipment for application of fertilizers. (3) Learn factors affecting penetration of soils by high-pressure liquid jets and apply knowledge in developing equipment for injecting anhydrous ammonia.
Agr. Engin. 10-333

Ill. Fundamentals, Equipment, and Techniques in Application of Agricultural Chemicals. Develop (1) information needed for design of inexpensive equipment to apply fertilizer solutions, using gravity flow and top venting, with variability of rate less plus 5%; (2) information needed for design of gravity fed nozzles suitable for broadcast application of fertilizer solutions; (3) adaptations of above equipment to existing machines (plows, planters, cultivators, etc.). Learn (4) feasibility of and factors affecting direct injection of anhydrous ammonia; (5) information needed for design of equipment to brand spray Randox. (6) Establish design characteristics of equipment suitable for application and incorporation of soil insecticides and herbicides. (7) Learn design characteristics of satisfactory equipment for application of granular DDT.
Agr. Engin. 10-336

Ill. Procedures and Equipment for Filling and Unloading Vertical Silos. To improve the efficiency and effectiveness of procedures and equipment for handling silage into and out of silos and eliminate manual handling.
Agr. Engin. 10-352

Ill. Crop Processing. To (1) improve farm crops by better methods of curing and handling, including testing and improvement of equipment to accomplish this purpose and (2) investigate cleaning of field seeds to remove foreign matter and noxious weed seeds to aid in weed control of farm crops.
Agr. Engin. 10-391 Coop. ARS

Ill. The Effect of Tillage, Planting Method, and Placement of Fertilizer on the Production and Maintenance of Forage Crops. To (1) determine effect of deep tillage and placement of fertilizer on grain and forage yields and maintenance of stand composition; (2) determine effect of various methods of seedbed preparation on grain and forage yields and stand composition; (3) study root development under above treatments; and (4) study effect of deep tillage and methods of seedbed preparation on water storage capacity of soil, availability of soil moisture and on soil, and water losses.
Dixon Springs 40-326

Ind. Determination of Drying Rates of Grains in Bulk Air Drying Systems. To (1) determine heat requirements for vaporization of grain moisture; (2) determine maximum drying rates as limited by characteristics of grain (exposed drying rates); and (3) develop methods to predict rates of drying of successive layers in a bulk of grain as influenced by system variables.
Agr. Engin. 273

Ind. The Development of Equipment and Methods for the More Efficient Conveying of Forages on the Farmstead. To study (1) effect of shape of forage blower impeller; (2) effect of tip clearance of forage blower impeller; (3) ways of reducing power loss thru friction in conventional forage blowers; (4) other means of accelerating chopped forages so that blower can be used only for mixing air to carry forage particles; (5) power requirements for conveying chopped forages by means of augers, belts, and chain conveyors. (6) Relate physical properties of forage to power required to move it by various methods.
Agr. Engin. 634 (NC-23)

Ind. Determination of Design Requirements for Agricultural Machinery. (1) Measure magnitude, frequency, and characteristics of loads and inertia and torsional forces in moving parts of principal farm machines operating under actual field conditions. (2) Learn power and energy requirements for each of several processes performed by a given machine.
Agr. Engin. 638

Ind. The Relation of Drying and Storage Practices to the Deterioration of Grain. To learn (1) relation of ventilation rate and weather to deterioration of grain during drying; (2) effect of moisture content and conditioning methods used on deterioration of ear corn in storage; and (3) effectiveness of and needs for low volume ventilation to prevent damage to stored grain and related products.
Agr. Engin., Agron., Biochem. 742 Coop. ARS

Ind. Methodology on and Determination of the Coefficient of Friction of Agricultural Products. (1) Develop a suitable procedure for determining coefficient of friction of agricultural products. (2) Learn values of coefficient for common agricultural products and conditions for which values exist.
Agr. Engin. 922

Iowa Utilization of Electric Service in Rural Areas of Iowa. To study (1) chore labor mechanization in which survey will be made of methods of performing chore operations of the larger and more efficient beef, swine and poultry enterprises; (2) heating with electricity for homes, farrowing houses, milk houses and milking parlors by use of radiant heating panels, space heaters and heat pumps; and (3) new types of household appliances.
Agr. Engin. 1282 Coop. ARS

Iowa Handling Grain Through Harvest, Drying and Storage. To evaluate comparatively on basis of capital requirements, operating costs and labor methods of handling grain from harvest through drying and storage. To develop and test a palletized system of handling grain from harvest through drying and to storage in relation to those methods now available. To develop, test and evaluate other new methods of handling grain which may become apparent during these studies. To examine design of grain drying installations in relation to harvesting machine capacities and performances.
Agr. Engin., Agr. Econ. 1295 Coop. ARS

Ky. Efficiency of Labor and Equipment in Handling Tobacco on Loose-Leaf Warehouse Floors. To discover ways of saving labor in the physical handling of tobacco received, sold, and loaded out by loose-leaf tobacco warehouses. More specifically, (1) to develop ways of organizing the crew for more efficient operation, (2) to devise mechanical equipment which may simplify or speed up the work, and (3) to discover the amount and arrangement of unloading space, of scales, of sales space, etc. which seems most effective in handling tobacco for sale for auction.
Agr. Econ. 25

La. Rice, Small Grain and Grass Seed Harvesting, Handling and Drying. To (1) determine most economical and efficient methods of harvesting; (2) determine cause and remedy for checking and breaking of grains; and (3) develop low cost farm storage and driers.
Agr. Engin. 501

La. Improved Methods of Harvesting, Handling, Curing and Storage of Hay and Silage. To (1) continue studies with duct systems and fan layout for barn hay drying adaptable to the present Louisiana barn; (2) continue developmental work on an economical burner and on safety controls for burning natural gas and butane; (3) make comparative studies handling costs for long hay vs. chopped hay and merits of equipment for handling each when using a barn dryer for finish curing; (4) continue development work and cost studies on use of forage wagons for drying chopped hay; (5) determine pressures on side walls of above-ground trench silos and most suitable type of material to use for sides under Louisiana conditions; (6) determine cost of constructing above-the-ground trench or horizontal silo using various types of materials for side walls; (7) determine spoilage on top of above-the-ground or horizontal silos with various methods of packing, and make comparison using various materials for cover; (8) determine most economical type of floor to be used in horizontal, self-feeding silo; and (9) determine the merit, if any, of chopped silage vs. long silage from a handling, labor, and equipment standpoint.
Agr. Engin. 571

La. Development of Machinery and Methods for the Planting, Cultivating and Harvesting of Sweet Potatoes. To (1) develop a machine to cut and bundle vine cuttings from a field plant bed; (2) learn most practical methods and means for applying weed controlling chemicals when planting sweet potatoes; (3) develop satisfactory cultivating tools when using chemicals for weed control; (4) develop means and methods for gathering sweet potato vines for silage; (5) develop machinery for cleaning vines from the row before digging, without damage to potatoes; and (6) continue developmental work on harvesting and handling machinery to meet changes in needs of handling, grading and processing.
Agr. Engin., Hort. 846

La. Grass and Weed Control. To evaluate and improve machines and methods (1) for disposal of crop residues in mechanical cotton production, (2) for planting cotton in mechanical cotton production, (3) for control of weeds in mechanical cotton production, and (4) for preparing cotton crop for mechanized harvest.
Agr. Engin. 858 (S-2)

La. Development of Techniques and Evaluation of Chemicals for the Defoliation and/or Second-Growth Inhibition of Cotton. (1) Screen and evaluate new chemicals as defoliants and second-growth inhibitors; (2) study process of abscission and second-growth inhibition; (3) develop ground spray machines for field application of defoliants and/or second-growth inhibitors; (4) evaluate different nozzles and nozzle arrangements; (5) determine proper spray volume and rate of chemical; (6) evaluate concept of bottom defoliation as an aid to reducing boll rot.
Pl. Path., Agr. Engin. 885

La. Sugar Cane Field Machinery. To build a functional, low-cost machine for constructing and maintaining quarter drains in sugar cane.
Agr. Engin. 922

Maine Improved Mechanization for Storing Forage Crops. To develop improved methods and equipment for: (1) field loading, unloading and conveying baled hay into storage; (2) unloading chopped hay and distributing it in storage; and (3) unloading grass silage and placing it in different types of silos.
Agr. Engin. 39 (NE-13)

Maine Study and Development of Improved Methods and Equipment for Harvesting and Moving Potatoes to Storage. To improve potato quality and handling efficiency through design and development of methods and equipment for harvesting and moving potatoes to storage.
Agr. Engin., Agron. 54

Maine Study and Development of More Efficient Methods and Equipment for Handling Potatoes Through Storage and Packing Houses. To improve potato quality and handling efficiency thru design and development of methods and equipment for handling, storing, and processing potatoes thru storage and packing houses.
Agr. Engin. 72 Coop. AMS

Maine Pruning Experiments on the Low-Bush Blueberry. Main objective is to develop a pruning method which might replace burning which is now used. It is also desirable to use some conventional methods of pruning in connection with burning to find more efficient and effective procedure and equipment for fields that have factors which make burning necessary. Also to learn under various conditions if a 2-year or 3-year cycle of pruning is most profitable.
Hort., Agr. Engin. 75

Maine Developing More Efficient Work Methods, Devices and Equipment for Physical Handling, Cleaning, Washing, Waxing, Grading, Sizing, Packaging and Other Related Practices on Maine Potatoes in Commercial Packing and Storage Houses. To increase productivity of labor employed in Maine potato storage and packing houses and reduce losses from decay, bruises, and other injuries by: (1) measuring relative efficiency of various types and combinations of types of equipment, including innovations, for performing materials handling, cleaning, washing, waxing, sorting, sizing, packing and other related practices in commercial potato packing and storage houses under variable conditions; (2) developing and testing improved methods for using various types and combinations of types of equipment for these operations; (3) developing plans for and testing prototypes of new types of equipment; (4) determining amounts of equipment of various sizes needed by packing and storage houses of various sizes to efficiently perform workload; (5) determining amounts of space that can be used in bins and store room when different types of equipment are used; (6) determining types of equipment and design of storage houses to most economically provide proper storage conditions; and (7) translating data from studies of materials handling practices into improved commercial facility designs.

Agr. Econ.,,Agr. Engin. 701, ES 299

Md. Pneumatic Handling of Chopped Forage. To (1) determine such factors as air velocity needed to completely float chopped hay both horizontally and vertically, ratio of air to material, effect of velocity on ratio of air to material, etc. in blowing chopped forage with special reference to partially cured chopped hay; (2) determine equipment needed to introduce chopped forage into air stream and place chopped hay uniformly on barn drying systems with emphasis on reduced labor and uniform drying; and (3) check and modify equipment developed above to use in other phases of forage handling.

Agr. Engin., Anim. Husb. R-16 (NE-13)

Md. Studies on the Efficiency of Fixed Boom Low Volume Sprayers. To (1) determine minimum amount of spray needed to secure adequate coverage and satisfactory control of insects on vegetable and canning crops; (2) develop efficient types of spray booms suitable for different row and broadcast crops; and (3) develop versatile equipment that may be used on several crops, particularly the adaptation of corn spraying equipment to spraying of peas and beans.

Agr. Engin., Ent. H-46-d

Mass. Mechanical Handling Methods for the Production of Superior Forage. To determine (1) machinery requirements for handling superior forage, and (2) manner in which findings in (1) can be adapted to available farm machinery and buildings.
Agr. Engin. 50 (NE-13)

Mass. The Mechanization of Cultural, Harvesting and Market Preparation Operations in Cranberries. (1) Design, construct, and test a self-propelled, low-gallonage, boom sprayer for insect, disease, and weed control use. (2) Design and construct a light-weight, self-propelled vehicle to be used in a wide variety of cultural and harvesting operations. (3) Study existing picking machines and design and make alterations for use in flood harvesting experiments. (4) Redesign present screener and separator for fresh fruit portion of crop only.
Agr. Engin. 51

Mich. Frost Control on Vegetation by Convected Heat, Infrared Radiation and by Sprinkler Application of Water. To (1) investigate all possibilities of generating infra-red which would be adaptable to frost control, and develop methods and equipment entailing lowest manufacturing costs, using liquid fuels, and using LP gas; and (2) investigate possibility of using hellicopter rotor as a method of bringing warm upper air down on the crop, with added heat.
Agr. Engin. 6-A

Mich. The Use of Several Tillage Methods for the Preparation of Seed Beds for General Agricultural Crops. The effect of various methods of seed-bed preparation on the resulting agricultural crops as to yield and quality will be studied. Observations will be made of the effect on the physical properties of the soil. Time and labor requirements of these methods will be recorded, and the power requirements of the several methods studied. Corn, beans, oats and beets will be used.
Soil Sci., Agr. Engin. 7

Mich. Thermal Resistance of Vegetative Cells and Spores of Microorganisms. (1) Design an apparatus to accurately control processing of food spoilage microorganisms by wet steam, superheated steam, and hot dry gases. (2) Obtain reliable data on resistance of food spoilage microorganisms to wet steam, and superheated steam. (3) Explain differences in thermal resistance of microorganisms to dry and wet heat.
Agr. Engin. 830

Mich. Handling and Storing White Pea Beans. (1) Obtain basic data concerning bean storage and spoilage. (2) Apply findings to solve problems of storage. (3) Improve efficiency of handling. (4) Reduce damage during handling.
Agr. Engin., Bot., Pl. Path. 834

Minn. Design and Development of Equipment and Methods for Weed Control. To (1) learn by laboratory or field tests, factors which affect operating characteristics of machines or machine elements used in all methods of weed control; (2) design and develop new machines or machine elements or improve available equipment; (3) formulate recommendations on proper use of weed control equipment; and (4) conduct laboratory or field tests to learn performance of weed control equipment.
Agr. Engin. 1208 Coop. ARS

Minn. Labor Saving Methods in Handling and Feeding Silage and Soiling Crops to Dairy Cattle in Outside Feed Lots. To (1) develop a system of feeding silage on outside feed lot for dairy cattle under loose housing system of management with these features: a silo unloading equipment, b conveying and distributing mechanism to uniformly distribute silage in feed bunks, and c provision for loading wagons or portable feed bunks where silage must be transported from silo to distant feed bunks; (2) incorporate in design of above equipment or develop additional equipment as needed for handling soiling crops brought to feed lot from the field and fed in same manner as silage, and (3) install and put into operation part or all of above system at the Station at Rosemount dairy unit and obtain performance data on its operation.
Agr. Engin. 1210 (NC-23)

Minn. Mechanism of Drying in Cereal Grains. (1) Study mechanism of moisture movement in drying of individual kernels of shelled corn; (2) rate at which moisture is removed from individual kernels while drying; (3) learn diffusion coefficient for movement of water within kernel.
Agr. Engin. 1213

Minn. Studies on Harvesting, Handling, Storage and Marketing of Table Stock Potatoes.--1. Studies on the Relation of Harvesting and Handling Operations and Storage Conditions to the Market and Culinary Quality of Potatoes. To improve the market and culinary quality of potatoes grown in the Red River Valley.
Hort., Agr. Engin., Pl. Path. 2118-1 Coop. ARS

Minn. Studies on Harvesting, Handling, Storage and Marketing of Table Stock Potatoes.--2. Studies on the Improvement of Potato Harvesting, Handling and Storage Equipment. To improve the market and culinary quality of potatoes grown in the Red River Valley.
Hort., Agr. Engin. 2118-2 Coop. ARS

Miss. Farm Mechanization as Related to Hill Section of Mississippi. To (1) study adaptation of various combinations of machines that may be used in mechanical production of corn, cotton and other row crops in hill section; (2) develop and adapt new machines for production of corn, cotton, and other row crops; and (3) study effect of data of harvest, plant characteristics, and field conditions on efficiency of row crop harvesters and to adapt or modify those harvesters to increase efficiency.
Agr. Engin. HB-1

Miss. Mulch Farming Requirements. To study (1) equipment needs and adapt or design equipment satisfactory for producing crops in mulch; (2) crops, spacing and fertilization needs of said crops for economical production by mulch methods; and (3) additional water requirements for crops, if any, due to mulch type farming.
Agr. Engin. HB-2

Miss. The Effect of Cultural Practices on the Physical Property of Soils. To determine (1) efficiency with which several deep tillage methods can be used to eradicate hard pans; (2) effect of tillage practices on physical properties of clay soils; (3) effect of long time use of winter legumes on physical properties of soils; (4) effect of intensity of secondary seedbed preparation; and (5) method of eliminating harmful effects of hillside seepage.
Agr. Engin. HB-6

Miss. Equipment for the Economical Placement of Seed and Fertilizer in Sod. To (1) design, construct, or adapt machinery for fertilizing and seeding pasture crops in a pasture sod; (2) design, construct, or adapt equipment for research studies for sod seeding on small plots; (3) study sod seeding as a soil and water conservation practice; and (4) study mechanical ways of rendering vegetation dormant for early fall seeding.
Agr. Engin., Agron. HB-8

Miss. Mechanized Harvesting and Feeding of Silage. To (1) evaluate available machines as to use in mechanized feeding program; (2) store silage harvested by (a) conventional equipment, row crop harvester, and other regular equipment as needed, (b) baled and stored in round form, and (c) baled and stored in rectangular bales in trench silo, or upright and stacks; learn labor problems, efficiency of storage, and storage problems; (3) modify present equipment to handle heavy silage in bale form and modify loading and unloading equipment for baled silage; (4) develop, modify and adapt transportation units so mechanized and/or self feeding is practical; (5) learn efficiency of feed system in converting feed into beef or milk, especially automatic feeders; and (6) study feeding problem when feed is in bale form to learn necessary equipment for handling.

Agr. Engin. HB-10

Miss. A Study of the Development of Equipment and Methods for the Blending of Agricultural Seeds. (1) Observe, analyze, and evaluate blending equipment and procedures. (2) Develop superior methods and equipment.

Agron., Agr. Engin., Agr. Econ. HSP-1 Coop. AMS

Miss. Improvement of Methods and Equipment for Growing Cotton. To (1) determine efficiency of different types of stalk shredders and improve machines for stalk disposal; (2) evaluate methods of seedbed preparation and learn effect of different methods of preparation on stand, weed control and crop yield; (3) learn effects of several deep tillage methods on hardpan soils of the Yazoo-Mississippi Delta; (4) learn effect of different openers and planting methods on stand and yield with special reference to improved seed germination and stands in heavy clay soils of the Yazoo-Mississippi Delta; (5) test, evaluate, and improve new or experimental equipment for field application of both liquid and granular fertilizers; (6) design, test, evaluate, and improve machines and techniques for the application of both pre- and post-emergence herbicides; (7) test, modify and improve mechanical methods of weed control, including flame cultivation equipment; and (8) evaluate and improve machines and methods for controlling cotton insects with particular emphasis on efficiency of application and adaptability of equipment for multiple uses.

Agr. Engin., Agron. RRFU-2-a (S-2) Coop. ARS

Miss. Improvement of Methods and Equipment for Defoliating and Harvesting Cotton. To (1) learn most effective stands and plant spacing for mechanical cotton harvesting in Delta; (2) evaluate cultivation and weed control practices and develop methods for efficient mechanical harvesting; (3) test and improve methods and equipment for application of defoliants and to learn effect of defoliation on mechanical picking efficiency and quality of machine picked cotton; (4) study mechanical characteristics of basic types of mechanical pickers and to learn their effectiveness under similar conditions; (5) learn amount of water actually added to seed cotton during picking operation and its ultimate effect on seed cotton storage and quality of lint; (6) investigate and locate causes of large concentrations of leaf trash and other foreign matter in mechanical cotton picker storage baskets; and (7) evaluate performance of mechanical pickers in commercial and advanced experimental varieties of cotton grown in the Mississippi Delta area.

Agr. Engin., Agron. RRFU-2-b (S-2) Coop. ARS

Miss. Incidence and Severity of Mechanical Scarification and Injury to Seeds During Processing, Grading and Handling Operations. To (1) learn frequency and extent of scarification and/or mechanical damage to seed as they are subjected to various processing activities; (2) evaluate influence of these actions on germination and vigor of seedlings, on the hard seed content of certain legumes, and on productivity of the resulting plants; and (3) learn means by which scarification or injury to seeds during the processing operation may be reached.

Agr. Econ., Agron., Agr. Engin. ES 396

Mo. Forage Harvesting, Handling, Storage and Feeding.--b. Handling Silage Crops When Harvesting and Feeding. To study the various methods and machinery used in handling silage, with particular emphasis on those operations performed when silage is fed from horizontal silos.

Agr. Engin. 138-b

Mo. Forage Harvesting, Handling, Storage and Feeding.--c. Harvesting, Processing and Feeding Forage as Hay. To study (1) methods of storing and feeding hay in the field; and (2) methods of curing baled hay by ventilating with unheated air.

Anim. Husb., Agr. Engin. 138-c

Mo.

Equipment and Procedures for Control of Weeds and Brush. Develop systems and equipment for control of weeds in (1) field crops, (2) horticultural crops. Design, develop and test equipment for (3) weed control in pastures, (4) brush control on agricultural lands, rights-of-way, and commercial areas. (5) Develop more accurate and efficient methods of applying chemical herbicides.

Agr. Engin. 153   Coop. ARS

Mo.

Grain Drying. To (1) study operating characteristics of grain drying systems, with emphasis on distribution of air in grain mass; and (2) obtain further data on conditioning of ear corn with unheated air.

Agr. Engin. 225

Mo.

Corn Production in Intensive Rotations With Small Grain. To learn (1) use of corn and compare it with other crops for use in intensive 2-crop, 1-year rotations; (2) methods and ways of improving techniques of quickly preparing seedbeds and planting corn and comparison crops following harvesting of small grain; (3) earliest stages of maturity practical for harvesting crops which will be followed by other crops in intensive rotations; (4) methods and to improve techniques of early harvesting of corn and comparison crops.

Agr. Engin., Field Crops 272

Mont.

Improvement of Dryland Tillage Equipment for Soil and Water Conservation. Improve dryland tillage implements and/or design new implements involving new principles of tillage in order to: keep stubble and trash on top of soil, reduce moisture loss during tillage operation, reduce power required, reduce wind and water erosion.

Agr. Engin. 28

Mont.

Improvement of Combine Harvesters. Improve small grain harvesting machines thru adaptation of different principles for cutting, threshing, and separation: to reduce power requirement and grain loss, to simplify separation mechanism, to reduce manufacturing cost.

Agr. Engin. 1018

Nebr.

Methods and Equipment for the Preservation of Grain and Forage on the Farm.--B, Hay Drying. To (a) develop an instrument for quickly determining with reasonable accuracy the moisture content of hay in bales, and (b) study methods and equipment suitable for drying hay on the farm.

Agr. Engin. 307-B

Nebr. The Use of Tempered Air for Conditioning Grain in Bulk Storage. To compare rates of drying, energy requirements for drying, weight changes and differences in quality when grain is conditioned in bulk storage by forced circulation of (1) untempered ambient air, (2) ambient air tempered to a relative humidity of 50% by recirculation of moist air in periods of low ambient humidity, (3) ambient air tempered to maintain relative humidity between 50% and 60% by recirculation of moist air in time of low ambient humidity and addition of heat during time of high ambient humidity.
Agr. Engin. 498 (NC-23) Coop. ARS

Nebr. Evaluation of Factors Affecting the Efficiency of Gaseous Powered Irrigation Pumping Plants. (1-2) Learn rate of change in efficiency of irrigation pumps and in specific fuel economy and power stability of gaseous-fuel engines used to power pumps. (3) Obtain operational records to supplement test data obtained for use in estimating maintenance costs of pumps and fuel engines. (4) Learn effect of variations in pumping head on performance of pumping plants.
Agr. Engin. 503

Nebr. Sidewall Buckling of Tractor Tires. (1) Develop techniques of detecting and methods of expressing tractor tire sidewall buckling; (2) study effects of tractive force, vertical load, tire air pressure, tire temperature, speed and slippage on sidewall buckling of rear tractor tires; (3) learn practical load limits below which tire buckling will not be serious.
Agr. Engin. 515

Nebr. The Integration of Machine Operations Required in Crop Culture. To (1) analyze machinery phases of crop culture to identify ways and means for minimizing field operations and machines required for tillage and planting; (2) develop and test more versatile tillage units which will stir soil, kill weeds, and leave crop residue on surface; (3) construct and test experimental machine units involving new principles applicable to development of more versatile means for metering and distributing seeds and other granular materials.
Agr. Engin. 572

N. J. Engineering Investigations in the Harvesting, Curing and Storage of Hay, with Particular Reference to Artificial Drying. To improve the efficiency of hay drying systems.
Agr. Engin. 53 (NE-13)

N. J. Engineering Investigations in the Curing and Storage of Chopped Hay. By research, learn fundamental characteristics of the drying process.
Agr. Engin. 60 (NE-13)

N. Mex. Development of Improved Methods and Equipment for Planting, and Late Weed Control in Cotton Production. To develop or modify (1) a planter opener and covering device to plant at uniform depth, prevent dry soil from being deposited around seed, prevent void space from remaining in soil around seed, reduce lateral placement of seed to minimum, and partially prepare seedbed during planting operation; and (2) equipment and methods for complete weed control.
Agr. Engin. 42 (W-24)

N. Y. (Cornell) The Basic Requirements and Design Principles of Mechanical Equipment for Control of Insects, Diseases, and Weeds. To study the requirement of mechanical equipment for pest control practices with the objective of determining basic information necessary to design new or to modify existing available equipment for practical use. To design and construct equipment for experimental use for the purpose of determining practical control measures and suitable machinery. Assemble information necessary to design sprayers for weed control in row crops, open fields, and lawns. Machines to be capable of applying concentrated herbicides at the rate of as low as one gallon per acre. Experimental machines built and used for field tests. Recognized procedures for plot testing shall be followed. Cooperating department will provide the herbicides and supervise the layouts of plots and measurements of material efficiency.
Agr. Engin., Veg. Crops, Ent., Pl. Path., Flor. 32

N. Y. (Cornell) The Adaptation and Development of Farm Equipment for the Efficient Handling and Processing of Diverse Products from the Farm Woodlot. To (1) promote sound woodlot management for more New York state farm woodlots; (2) increase cash income from farm woodlot; (3) enable farmer to harvest his woodlot crop with minimum of effort and time and with existing or adapted farm equipment; (4) provide more of farm's need of fiber and organic matter for litter, bedding, and soil humus; (5) Up-grade woodlot products by farm processing to create a more salable product with greater value; (6) provide higher standard of living for "hill" farmers; and (7) provide easily handled, cheap fuel in areas where oil and coal are high.
Agr. Engin., Agron., Anim. Husb. 34

N. Y.
(Cornell)

The Development of Materials Handling Methods and Equipment for Reducing Labor in Caring for Livestock Including Reference to Harvesting, Processing, Storing, and Feeding. To develop suitable methods and equipment for handling materials necessary for livestock feeding and care in order to reduce manual labor now required, so that it should be possible to increase the output per man, hence reduce unit cost of production.

Agr. Engin., Anim. Husb. 35 (NE-13)

N.Y.
(Cornell)

Development of Improved Methods and Equipment for Tillage, Seeding and Fertilizer Placement. To develop improved methods and equipment for seedbed preparation, and seed and fertilizer placement for vegetable and forage crops in state.

Agr. Engin., Agron. 40 Coop. ARS

N. Y.
(Cornell)

The Mist Concentrate Method for Applying Fungicides to Fruit Trees, with Consideration Given to Spray Formulations, Phytotoxicity, and to Modification of Application Equipment. To (1) gain more specific information on the formulation of the spray mixture and its influence on both the efficiency of the methods for disease control and on phytotoxicity for instance as savings in amount of toxicant materials required, and study of formulations with respect to adjuvants added; (2) determine the feasibility of concentrating the newer fungicides as they become available, as many have already proved effective but have not been adequately tested in the mist concentrate method, nor has the method been adequately tested on all fruit crops with the materials which are effectively applied to a few; and (3) study needed modifications in the equipment, as growers are anxious that the fixed-outlet machine developed under this project be constructed so that the spray may be delivered to both sides of the machine at once, which will require research to determine if it is feasible, and if so, how best to accomplish it; also to reduce hydraulic pressure on the spray and still obtain adequate atomization.

Pl. Path., Agr. Engin., Ent. 126

N. Y.
(Cornell)

A Study of Some Cultural, Harvesting, and Handling Problems in Fruit Production; to Improve or Develop Equipment and Methods of Use to Reduce Labor and Fruit Losses. (1) Find ways to reduce labor costs and fruit damage during picking, handling and transporting to storage and handling in processing plants; (2) make improvements on, or development of an apple grader-sizer to reduce bruising; (3) improve packaging methods, packing house layout and equipment to reduce labor and fruit injury, thus putting an inexpensive packaged product on market; (4) develop suitable brush removal equipment to dispose of prunings; (5) learn best pruning methods, and improve or develop equipment: hand or power pruners, or a combination of both; use of ladders, pruning platforms or mechanical towers; combine a pruning and harvesting machine for grapes.

Agr. Engin. 205

N. Y.
(Cornell)

The Evaluation of Requirements for Improved Designs of Braking Systems for Farm Tractors and Trailed Equipment. Learn (1) conditions under which present system of brakes and braking on tractors can be improved; (2) conditions under which trailed vehicles or implements should have braking systems; (3) effects of improved braking systems on directional control and stopping distance; (4) methods for improving dissipation of energy by braking systems on tractors; (5) relative merits of present and possible improved systems with regard to safety and cost.

Agr. Engin., Agr. Econ. 206

N. C.

Weed Control Methods and Machinery. (1) Evaluate methods and equipment for controlling weeds under varying weather and soil conditions; (2) develop equipment to provide effective control in an efficient and economical manner.

Agr. Engin., Agron. 9 (S-2) Coop. ARS

N. C.

Tobacco Mechanization. To determine principles pertaining to the mechanization of tobacco culture, evaluate their importance and apply them toward improving present cultural practices.

Agr. Engin., Agron. 11 Coop. ARS

N. C.

Planting Methods and Machinery. (1) Evaluate effects of components of planting machinery in terms of physical environmental factors, seed germination and plant development; (2) Develop planting equipment that will fulfill optimum conditions for emergence in an effective and economical manner as determined under above objective.

Agr. Engin., Agron. 13 (S-2)

N. C. Forage Drying and Preservation. (1) Evaluate new ideas to lower labor and investment needs for producing and holding forages in a high state of preservation; (2) eliminate worry and quality losses from weather hazards associated with conventional preservation; (3) make forage preservation easier so as to fit more conveniently into farm activities; (4) develop methods found successful in above objectives into practical system/s of forage preservation.
Agr. Engin., Anim. Indus. 14

N. Dak. The Development and Testing of Equipment to Measure the Resistance of Potatoes to Bruising and Injury. To develop and test equipment to measure resistance of potatoes to bruises from impact, pressure, and abrasion.
Agr. Engin., Agr. Econ., Hort. 4-1

N. Dak. Mechanical Handling of Silage and Grain From Storage to Feed Bunks in Open Feed Lots. To develop (1) plans for equipment to handle silage and grain from storage to open feed lot and automatic feeders in milking parlors; and (2) heating unit to thaw silage in upright silos, and investigate possibility of preventing freezing with use of salt and other materials.
Agr. Engin., Anim. Husb. 4-3 (NC-23)

N. Dak. The Effect of Forced Air Drying on the Quality of Malting Barley and Durum Wheat. To learn effects of drying with forced air at different temperatures on (1) germination and malting quality of barley, (2) milling and macaroni processing quality and germination of durum wheat.
Agr. Engin., Cereal Technol. 4-7

Ohio

A Study of the Harvesting and Storing of Corn and Small Grains. To study the Ohio grain crops in regard to the factors which insure good harvestibility and storage. I. Corn. To (1) study how mechanical picking quality is influenced by various plant factors; (2) evaluate influence of weather, time of day, stage of maturity, and machine adjustment on quantity of shelled corn, husks, and silks; (3) build and test cleaning and distributor equipment to eliminate or distribute in crib the shelled corn, husks, and silks; (4) study basic shellage actions by which corn may be shelled in an effort to find a method by which immature corn may be shelled without excessive damage to the kernel; and (5) thru temperature and air flow patterns, to evaluate various crib loadings which result from distribution equipment, various machine types, various crib designs, and different degrees of cleaning. II. Wheat. To (1) establish procedure for comparing and rating wheat varieties for combining characteristics; (2) determine plant factors influencing satisfactory harvesting; and (3) make recommendations for possible machine changes which will aid harvesting. III. Soybeans. To (1) evaluate present and new varieties for field harvestibility, and (2) evaluate items 2 and 3 under wheat for soybeans.

Agr. Engin., Agron. 82

Ohio

Basis for Agricultural Aircraft Equipment Design. To (1) provide basis for better agricultural aircraft solids distributor design and placement; (2) provide basis for design of metering devices, agitators, hoppers, and power source and transmission systems; (3) assemble information on spray equipment and provide basis for combination liquid and solids dispensing equipment; and (4) check lab results with controlled field studies for effectiveness of application, performance of equipment and information on application requirements, including rate, distribution, coverage, and type of material.

Agr. Engin. 83

Ohio

Control of Soil-Inhabiting Nematodes, Fungi, Bacteria and Insects Affecting Vegetable Crops. To (1) determine and classify soil-inhabiting organisms responsible for economic loss on vegetable crops growing in Ohio soils; (2) devise means of controlling most destructive organisms; and (3) design and test types of equipment and application techniques for use in applying various liquid and dry formulations in the control of soil-inhabiting pest complex on vegetables.

Bot., Ent., Agr. Engin. 131 Coop. ARS

Ohio

Improving Methods and Equipment for Harvesting Soybeans. (1) Evaluate problems involved in soybean harvesting under farm conditions; learn extent and nature of losses; (2) learn principles of operation and adjustment of existing equipment resulting in highest harvesting efficiencies and bean qualities; (3) learn feasibility of high moisture harvesting and subsequent drying as a means for reducing losses and permitting more timely wheat seeding after soybean harvesting; (4) develop and evaluate design changes and changes in equipment as methods for reducing harvesting problems.

Agr. Engin. 162

Okla.

Mechanized Cotton Harvesting in Oklahoma. Subproject IIA. (1) To evaluate several methods of preparing the cotton for harvest and several dates of preparation as such preparation affects the performance of the cotton harvester and the resulting quality and new yield of cotton; Subproject IIA (2). To (1) evaluate and improve stripper roll materials, to evaluate the influence of stripper roll speed on harvester performance, and to evaluate and improve the stripper roll shielding and entrance section shielding on present commercial cotton harvesters; (2) evaluate the various methods of conveying cotton from the stripping chamber to the wagon with particular emphasis on amount of cleaning obtained by each method of conveying, and also to learn the elements of cotton conveying which affect the quality of cotton lint; and (3) evaluate and improve other functional mechanisms of the cotton stripper not referred to in the above objectives, to evaluate other machines involving new principles, and to evaluate cotton pickers for their possible application to Oklahoma conditions; Subproject IIB. To (1) evaluate harvester performance on most common varieties of cotton grown in Oklahoma; and (2) evaluate and improve harvester performance as related to different plant populations and characteristics typical of different populations.

Agr. Engin. 578 (S-2) Coop. ARS

Okla. Adapting and Testing Cotton Ginning Equipment and Techniques. Regional Sub-Project IV-A. To (1) test, evaluate, and improve new or experimental equipment for adaption of Oklahoma type cotton production; and (2) devise, test, evaluate and design methods and techniques for preparing, conditioning, and ginning cotton harvested mechanically under new or experimental field conditions; Regional Sub-project IV-B. For cotton grown in (a) humid upland, (b) humid bottomland, (c) dry upland, and (d) irrigated upland. To (1) determine the combination of drying, cleaning, and extracting machinery in overhead systems; (2) determine the correlation between drying and lint cleaning; (3) determine amounts of overhead and lint cleaning equipment to be used in rough harvested cotton; and (4) study effects of cleaning on color of lint sample.

Agr. Engin. 753 (S-2)

Okla. Development of Improved Machines and Methods for Seedbed Preparation Planting and Early Weed Control in Cotton Production. Subproject I-B. To evaluate some newer tillage tools for their place in seedbed preparation for cotton production; Subproject I-C. To (1) evaluate existing seed grading equipment and determine physical measurements of cotton seeds; (2) evaluate performance of different grades of cotton seed as to emergence and yield; (3) evaluate performance of graded seed in now available planters and modify planters to exploit unique physical dimensions of seed; (4) evaluate planter performance in obtaining different plant populations; (5) study beneficial effects of planting seed at different depths; (6) evaluate and improve present furrow openings on cotton planters; (7) evaluate and improve seedbed profiles as they may promote more rapid and better emergence; and (8) evaluate available covering devices now used; Subproject I-D. To (1) determine influence of machines and chemicals now available for early weed control; (2) find influence of plant population on number of weeds and ease of controlling weeds; and (3) improve seedbed profiles to minimize early season weed control problem.

Agr. Engin. 802 (S-2)

Okla. Design, Development and Testing of Fertilizer Placement Machinery. To (1) develop experimental machines and methods for placing fertilizers at various rates, spacing and depth for row and drilled crops, permanent and temporary pastures, and specialized crops; (2) testing experimental machines and methods in several crop areas, soil types, various moisture conditions, and fertility levels to determine crop response to spacing, depth, amount, kind and time of fertilization; and (3) develop prototype machines for fertilizer placement based on findings in (2).

Agr. Engin., Agron. 815

Okla. The Mechanization of Castor Bean Production and Harvesting. (1) Learn principles of operation needed for successful castor bean harvesting and discover, design and develop harvester components that adhere to principles, give special emphasis to entrance and gathering sections, mechanisms for revolving beans from stalk, seals to minimize seed before hulling, develop and make changes in equipment to harvest varieties that may be developed. (2) Continue work on hullers, placing emphasis on: service life of huller components, efficiency of hulling and of separation, more compact and simplified design, and combine hulling with harvesting. (3) Develop planter seed boxes that will meter seeds accurately. (4) Learn best placement for fertilizer in relation to bean seed for maximum responses and develop fertilizer placement machine. (5) Survey health hazards from bean seed and dust and incorporate mechanical contrivances for minimizing this hazard into the design of machines for production and harvesting of beans.

Agr. Engin. 924 Coop. ARS

Oreg. Effects of Nozzle Design and Solution Properties on Drop Size and Spray Drift. Learn effects of nozzle design and solution properties on spray drift; learn drift potential of each nozzle type and size.

Agr. Engin., Agr. Chem. 313

Oreg. Development and Testing of Equipment for Seeding Grasses on the Sagebrush-Bunchgrass Range. Design, construct and test seeding equipment for firming soil in strips or furrows and planting seed at a uniform and proper depth in center of furrow with firm soil below and less firm soil above seed.

Agr. Engin. 316

Pa. Methods of Preservation and the Measurement of the Nutritive Values of Forage Crops.--E. The Nutritive Value of Hay as Affected by the Method of Curing. To determine (1) if it is feasible to bale hay at moisture higher than 20%, which is safe for good keeping in storage, by adding a preservative agent at time of baling or storage; (2) best method to apply sodium bisulfite at baling to insure uniform distribution thru the bale; and (3) by nutritive evaluations if addition of sodium bisulfite results in enough saving of feed nutrients present in forage to justify additional cost and application.
Anim. Nutr., Agron., Agr. Engin. 1016-E

Pa. Handling Chopped Forage. To (1) evaluate present methods and devise new methods for handling chopped hay and corn from field to mow or silo; (2) further perfect method of using mechanical conveyors suitable for dried, wilted, and green chopped forages; and (3) develop a general purpose wagon box for transporting chopped forages along with a suitable and practical wagon unloader.
Agr. Engin. 1053 (NE-13)

Pa. Tillage Tool Design and Performance. To improve design and performance of tillage tools by getting the information on soil resistance to them and relating this to design and control of tools, and (2) evaluate methods of plowing and seedbed preparation for corn and potatoes, considering yield, cost, suitability for stony land, and relating weed, insect and erosion control.
Agr. Engin. 1083

Pa. Air Distribution in Drying Hay and Grain. To (1) improve performance of hay and grain driers by studying ways of getting better distribution of air thru material being dried; and (2) develop improved technique for measuring air distribution in hay and grain.
Agr. Engin. 1198 (NE-13)

Pa. The Agricultural Engineering Aspects of Deep Tillage of Pennsylvania Soils. (1) Study and evaluate applicability of various types of deep tillage equipment and equipment for deep placement of lime, fertilizers, and other chemicals. (2) Learn draft requirements and vertical soil resistance for subsoiling various soils at depth of 12, 18, and 24 inches, and spacing of 1, 2, 3, and 4 foot widths.
Agr. Engin. 1260-B Coop. SCS

Pa. An Economic and Engineering Appraisal of Mechanical Barn Gutter Cleaners. To learn (1) time needed to clean gutters for different gutter cleaner installations using various bedding materials; (2) physical forces imposed on different types of cleaners as they may be affected by various bedding materials and frequency of cleaning, to improve design of cleaner; (3) time required for cleaning before and after installation of gutter cleaner; (4) economic feasibility of using gutter cleaners for different size herds.

Agr. Engin., Agr. Econ., Dairy 1282-B

S. C. Harvesting Cotton Mechanically in the Piedmont and Coastal Plains Areas of South Carolina. To (1) evaluate and improve a. machines and methods for preparing the cotton crop for mechanized harvest, and b. machines and methods for mechanical harvesting, (2) evaluate mechanical harvester performance in relation to plant characteristics, and (3) investigate possibilities of removing the cotton from the plant by principles other than the conventional ones now being used.

Agr. Engin. 10 (S-2) Coop. ARS

S. C. Developing a High Speed Mechanical Peach Pitter for Southeastern Freestone Peaches. To develop a high speed, or large volume freestone peach pitter which would be low in cost, efficient in use, and simple to operate, for use by commercial canners, freezers, and other peach processors.

Agr. Engin., Hort. 68

S. C. Handling Seed Cotton From the Plant to the Gin in the Piedmont and Coastal Areas of South Carolina. (1) Evaluate, modify, and improve present methods and equipment used in handling seed cotton from picking to ginning. (2) Design and develop new equipment and methods for handling cotton from time of picking to ginning. (3) Evaluate and improve methods of handling seed cotton for maximum preservation of inherent qualities of lint and seed from time of picking to ginning.

Agr. Engin. 97-H (S-2) Coop. ARS

S. C. Harvesting Small Seeded Legume and Other Forage Plant Seed Crops. To determine most efficient method of harvesting forage plant seeds.

Agr. Engin. 127 Coop. ARS

S. C. Causes of Non-Fluffed Locks in Cotton and Their Effect on Yield, Quality, Mechanical Harvesting and Ginning. Learn (1) influence of insects and insecticides; fungi and bacteria; defoliants and defoliation; soil temperature, atmospheric temperature, and soil moisture on occurrence of non-fluffed locks; (2) influence of non-fluffed locks on mechanical picker performance; ginning; lint fiber qualities; seed quality and germination; yield of seed cotton, seed and lint.

Agr. Engin., Ent. 395 Coop. ARS

S. C. Design of Automatic Feed Handling and Processing Installations. To (1) design automatic feed processing and handling installations for several sizes of operations, emphasizing efficient use of labor through utilization of modern and automatic equipment and use of equipment which will either improve or maintain quality of product being processed, (2) utilize above designs in preparing plans for distribution.

Agr. Engin. 406

S. Dak. The Use of Crop Drying and Crop Conditioning Machinery and Equipment for South Dakota Crops. (1) Test practicability of conditioning wheat in storage by small electric motors and single air distribution ducts (in cooperation with Commodity Research Division, Grain Branch, on CCC wheat in storage). Minimum requirements of air flow and tube size will be learned. (2) Develop equipment for coordinating and comparing drying of crops in typical farm buildings as compared to carefully controlled conditions of experimental crop drying. (3) Equip a building and arrange equipment suitable for controlled drying tests on grain and hay crops. (4) Make available all crop drying equipment for careful research tests and for drying of crops under field conditions.

Agr. Engin., Agr. Econ. 246

Tenn. Food Processing Machinery Development. To develop (1) jumbo sweet potato cutter and sizer; and (2) automatic okra butt end trimmer.

Agr. Engin. 26

Tenn. Investigations in Structure and Mechanical Equipment for Storing, Drying, and Handling Hay. To determine some optimum relationships of drying factors affecting the efficient use of heat, factors affecting color loss of hay in storage, and the adaptations of elevators, storage units, and hay moving devices, especially as applied to round storage bins. It is an attempt to provide a very efficient all mechanized hay drying and storage unit.

Agr. Engin. 27 Coop. TVA

Tenn. Harvesting and Processing of Grass and Legume Seeds Under Southern Conditions. To (1) study several methods and machines now used in production and harvesting of grass and legume seeds and to determine their relative value; and (2) develop improvements in techniques and modify, design and construct test equipment or machinery to contribute to effective commercial legume and grass seed production, harvesting and processing.

Agr. Engin. 29 Coop. TVA

Tenn. Investigations in the Improvements of Sprayers and Non-Solid Fertilizer Distributors. (1) Improve field type liquid spreaders such as sprayers and liquid fertilizer distributors including pressurized and non-pressurized liquids. (2) Develop liquid spreaders for use on rolling or uneven land where it is hard to maintain a constant speed.

Agr. Engin. 31

Tenn. Rapid Methods for Measuring Lengths and Other Properties of Cotton Fibers. To determine (1) the adaptation of the photo-electric cell to the measurement of the length of lint in ginned cotton; (2) the value of the clamped-silver-weight method for determining the final length statistic; and (3) to develop a rapid method of measuring fineness.

Phys., Agr. Engin. 130 Coop. ARS

Tenn. Development of New and the Improvement of Existing Instruments and Techniques for Measuring Properties of Cotton. Develop instruments that will effectively utilize the "rapid methods for measuring physical properties of fibers". Study and attempt to improve existing instruments. Develop and refine testing techniques.

Phys., Agr. Engin. 131 (S-1)

Tex. The Development and Improvement of Machines and Methods Used in the Mechanization of Cotton Production, Harvesting and Processing in Texas. To design and improve machines and develop methods which will reduce manpower needs to a minimum and increase output per laborer to a maximum with respect to the growing of cotton by the evaluation and improvement of machines and methods.

Agr. Engin., Agron. 601 (S-2) Coop. ARS

Tex. Economic Aspects of the Mechanization of Cotton Production and Competing Enterprises in Selected Areas. To (1) learn effects and efficiency of certain desiccants and defoliants on yield and quality of cotton; (2) evaluate relative cost of harvesting cotton mechanically after using harvest-aid chemicals as compared with hand harvesting; (3) learn factors which contribute to successful use of mechanical strippers.

Agr. Engin., Agr. Econ., Pl. Physiol. and Path. 606
Coop. ARS

Tex. Treatment of Onions to Extend the Marketing Period. To (1) develop a commercially practical infra-red post harvest onion treatment; (2) construct an experimental moving belt-type infra-red onion treating apparatus; and (3) determine any detrimental effects a standardized infra-red treatment may have on keeping quality of untested commercial varieties.

Pl. Physiol. and Path., Agr. Econ., Agr. Engin.,
Hort. 665

Tex. Spraying Equipment for the Control of Cotton Insects and for Defoliation. To (1) improve spraying equipment in efforts to obtain better distribution of chemicals for control of pink bollworm; (2) determine nozzle type, arrangement and spacing to give optimum spray patterns for insect control including pink bollworm and for defoliation of cotton plants; and (3) check insect infestations to determine effectiveness of insecticidal applications with various types and arrangements of nozzles on booms and effects of chemical removal of foliage of cotton on full populations of insects, especially overwintering of pink bollworms in unharvested material.

Agr. Engin., Ent. 722

Tex. *Drying and Storing Sorghum Grains in Farm Storage Bins in South Texas.* 1. In drying with unheated air, to determine effect of various rates of air flow thru stored grain of different initial moisture contents and at various depths on the following: rate of moisture removal, power needs, germination, infestation by microbiological organisms, fat acidity, and market grade; to modify existing air distribution systems as indicated by previous research and check uniformity of air distribution throughout the mass of grain; and to revise operating procedures for drying grain with unheated air; 2. In storing dry grains: learn minimum air flow needs for maintaining high quality grain with mechanical ventilation; establish operating procedures and use of automatic controls for aerating grain during storage; learn practical and economical methods of handling grain in and out of storage; learn effective means of controlling insects; and learn effects of moisture, temperature and different storage procedures on microbiological infestation.

Agr. Engin. 1001 Coop. AMS, ARS

Tex. *Drying and Storing Rice in Farm Storage Bins in Texas.* *Drying with unheated air.* To (1) determine effect of rates of air flow thru stored rice of different initial moisture contents and at various depths on: rate of moisture removal, power needs, germination, infestation by microbiological organisms, fat acidity, milling quality; (2) modify present air distribution systems as indicated by research, and check uniformity of air distribution throughout the rice; (3) revise operating procedures for drying rice with unheated air. *Storing dry rice.* To determine (1) practicability of using forced ventilation for maintaining quality during storage; (2) effective means of controlling insects; (3) practical and economical methods of moving rice during drying and in and out of storage; and (4) effects of moisture, temperature and different storage procedures of microbiological infestation.

Agr. Engin., Agron. 1002 Coop. AMS, ARS

Vt. *The Mechanical and Structural Aspects of Harvesting, Curing, Housing, and Removal from Housing of Grain, Hay, Silage, and Bedding.* To develop methods of handling which will result in: 1. reduced labor, 2. reduced capital investment in building, 3. reduced fire hazard in storage, 4. improved quality of hay by mow curing as against field curing, and 5. reduced field losses due to inclement weather.

Agr. Engin. 24 (NE-13)

Va. Tillage and Machinery Problems in the Application of Soil and Water Conservation Practices. To develop suitable tillage practices for the effective application of mulch culture principles in the various geographical areas of the state, including determination of the machinery problems involved, the construction and testing of experimental models and the modification of existing equipment. To study the operating characteristics of existing farm machines in connection with the application of conventional soil and water conservation practices, and to devise where possible, ways and means of overcoming critical deficiencies in their present operating capabilities.
Agr. Engin., Agron. 86002 Coop. ARS

Wash. Mechanical Planting as a Means of Artificial Regeneration on Eastern Washington Denuded Forest Areas. Study machine planting of forest trees in Eastern Washington denuded areas.
For. and Range Mgt. 1338

W. Va. Determination of Factors Influencing the Drying Rates of Grains. To determine (1) limitations on removing moisture from grain; (2) critical temperatures, air volumes, humidities, air velocities, time factors, and (3) effect that drying conditions have on germination.
Agr. Engin. 15

W. Va. The Mechanization of Forage Crop Harvesting, Processing, Storing and Feeding. To determine mechanical requirements and develop methods and equipment for production of high quality forage with special reference to operation of: harvesting, processing, storing, and feeding.
Agr. Engin., Anim. Husb., Dairy Husb. 69 (NE-13)

Wis. A Study of Methods, Equipment Operating Practices and Costs in Measuring Bulk Milk. To study (1) methods of determining quantity of bulk milk by comparing measurement by calibrated measuring rod, electric probe, flow meter, and by tank scales; (2) milk house floor construction and tank setting methods necessary to insure stability of calibrated bulk milk tanks.
Agr. Engin. 408-E (NC-23)

Wis. The Preservation of Forage Crops. To develop better methods of preserving forage crops (hay crops) so as to reduce losses.

Bact., Agr. Engin., Agron., Anim. Husb., Dairy Husb. 522

Regional Research, Including States with Contributing Projects

NC-23 Requirements and Design of Structures and Related Equipment for Unified Farmstead Operations. (1) To establish and conduct investigations in the area of Farm Buildings and related equipment sufficient in scope that the various phases of structural design, production requirements, environment, materials handling, labor efficiency, and mechanisms may be studied in detail and coordinated into recommendations for efficient farmstead operations. (2) To define the areas of research needed for planning of unified operations within the farmstead as follows: a. control of environment within structures; b. efficient labor, management, and mechanization for handling, processing, and storing livestock feed, forage, and bedding, and removing manure; c. efficient labor management and mechanization for animal production and handling, storing, processing, and controlling quality in harvested food crops, and animal products; d. performance and requirements of structural materials and their application to design in the development of buildings and related equipment. (3) To initiate specific sub-projects insofar as resources permit, that will outline work planned for the areas of research described under objective 2.

Cooperating stations and agencies: Federal-grant projects - Ind., Minn., Nebr., N. Dak., Wis., and ARS.

The following additional stations have contributing Federal-grant projects which will be found in Section c: Ill., Iowa, Kans, Mich., Mo., and S. Dak.

NE-13 The Mechanization of Forage Crop Harvesting, Processing, Storing and Feeding. To determine the job and mechanical requirements and develop methods and equipment for the production of quality forage with special reference to the operations of: (1) harvesting, (2) processing, (3) storage, and (4) feeding.

Cooperating stations and agencies: Federal-grant projects - Conn. (Storrs), Maine, Md., Mass., N. J., N. Y., Pa., Vt., and W. Va.; and ARS.

S-2 **Mechanization of Cotton Production, Harvesting, Ginning and Cleaning.** (1) To design and improve machines and develop methods which will reduce manpower requirements to a minimum and increase output per laborer to a maximum with respect to the growing of cotton. (2) To design and improve machines and develop methods which will reduce manpower requirements to a minimum and increase output per laborer to a maximum with respect to the harvesting of cotton. (3) To design and improve facilities and develop methods for improvement in the storage and handling of cotton with emphasis on mechanically harvested cotton. (4) To design and improve machines and facilities for the ginning and cleaning of cotton, with emphasis on mechanically harvested cotton.

Cooperating stations and agencies: Federal-grant projects - Ala., Ark., Ga., La., Miss., N. C., Okla., and Tex.; and ARS.

W-24 **Improvement of Mechanized Production and Harvesting of Irrigated Cotton in the Arid and Semiarid West.** (1) To develop and/or modify methods and equipment for land preparation, planting, cultivating, and application of agricultural chemicals. (2) To determine the effect of machine adjustments, new or modified machines, harvesting procedures, defoliation, and other cultural practices on mechanical harvestings. (3) To determine the desirable cotton plant and fiber characteristics for mechanical operations.

Cooperating stations and agencies: Federal-grant projects - Ariz., Calif., N. Mex.; and ARS.

The following regional projects in related fields may be found in other parts of the "compilation of research summaries" as indicated:

S-1 **Genetics and Cytology of Cotton.** Part 8.

LIST OF COMPILATIONS OF FEDERAL-GRANT RESEARCH PROJECTS AT STATE AGRICULTURAL EXPERIMENT STATIONS

ARS-23-8: Part Numbers	Subject-Matter Area	Title of Section
1	Agricultural Chemistry	Agricultural Chemistry
2	Agricultural Economics	a. Prices, Incomes, & General Studies of Commodities & Industries b. Farm Management c. Land Economics d. Farm Finance & Taxation
3	Agricultural Engineering	a. Land & Water Use & Development b. Power Machinery & Equipment c. Farm Structures & Materials
4	Animal Husbandry	a. Beef Cattle b. Sheep & Goats c. Swine
5	Dairy Husbandry	Dairy Cattle
6	Dairy Technology	Dairy Technology
7	Entomology & Economic Zoology	a. Field Crop Insects b. Fruit, Nut & Vegetable Insects c. Miscellaneous Insects & Economic Zoology d. Insecticides
8	Field Crops	a. Cereal Crops b. Oil, Fiber, Tobacco & Sugar Crops
9	Food Science & Technology	a. Food Chemistry, Microbiology, Sanitation & Public Health b. Food Engineering, Processing, Product and Process Development, Utilization and Waste Disposal c. Food Quality & Standards, Acceptance, Preference, & Marketing
10	Forage Crops, Pastures & Ranges	Forage Crops, Pastures & Ranges
11	Forestry	Forestry

ARS-23-8: Part Numbers	Subject-Matter Area	Title of Section
12	Fruits & Nuts	Fruits & Nuts
13	Home Economics	a. Human Nutrition b. Housing c. Clothing & Textiles d. Foods-Consumer Quality & Utilization e. Household Economics & Management
14	Economics of Marketing	a. Field Crops b. Fruits & Vegetables c. Livestock, Meats & Wool d. Dairy Products e. Poultry & Poultry Products f. Forest Products & Ornamental & Drug Plants g. Cross-Commodity & Functional Studies
15	Meteorology	Meteorology
16	Ornamental & Drug Plants	Ornamental & Drug Plants
17	Plant Pathology & Bacteriology	a. Plant Pathology, Botany, & Diseases of Miscellaneous Crops b. Diseases of Field Crops c. Diseases of Fruit Crops d. Diseases of Vegetable Crops
18	Plant Physiology & Nutrition	Plant Physiology & Nutrition
19	Poultry Industry	Poultry Industry
20	Rural Sociology	Rural Life Studies
21	Soils	a. Soil Chemistry & Microbiology b. Soil Fertility, Management & Soil-Plant Relationships c. Soil Physical Properties, Conservation & Classification
22	Vegetables	a. Vegetable Crops b. Potatoes
23	Veterinary Science	Veterinary Science
24	Weeds	Weed Control